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The invention relates to a heat-transfer agent, in particular intercoolers for motor vehicles, in accordance with the preamble of Claim 1.

Such a heat-transfer agent is from the document DE 197 57 034 A1 known and consists of between an air inlet plenum chamber and an air outlet plenum chamber arranged flat tubes and these associated waving ribs. The flat tube ends are fixed held thereby of tubesheets, which are part of the air inlet and air outlet plenum chamber in each case. The flat tubes of the load air of a turbocharger of an internal combustion engine flowed through, whereas the waving ribs are washed by ambient air. Adverse one to such known heat-transfer agent is that it comes by a turbulent mixture of load air with the almost resting or slow flowing air, flowing from the flat tube ends, in the air outlet plenum chamber to pressure losses.

The invention is the basis the object to train a heat-transfer agent further that in such a manner initially mentioned type that the pressure losses in the region of the air outlet plenum chamber become reduced.

This object becomes 1 dissolved with the features of the claim.

Provided is according to invention that a flow hopper is parallel to the tubesheet of the air outlet plenum chamber arranged, which exhibits the flat tube ends associated openings with air guidance elements, which extend toward the interior of the air outlet plenum chamber and which flat tube ends extend after type of a diffuser. By this extension of the flat tube ends in the form of diffuser elements load air in the region of the exit becomes from the flat tube ends delayed, which the subsequent pressure losses during the mixture with the resting or slow flowing air in the air outlet plenum chamber significant reduced. Each flat tube end own diffuser element is associated.

In development of the invention are according to claim 2 provided that the air guidance elements adjacent openings are finallaterally connected in each case. By a such geometric design of the air guidance elements flow losses can be decreased by tearing off vortexes, which can form in the end region of the air guidance elements.

In other aspect of the invention according to claim 3 exhibit the air guidance elements an alignment toward an air outlet of the air outlet plenum chamber, by being longitudinal axis of the air guidance elements opposite the longitudinal axis of the flat tubes inclined arranged. This alignment of the air guidance elements toward the air outlet is particularly for the case of advantage, arranged not in which the air outlet is finallateral central, but concerning the air outlet plenum chamber, so that the air effluent from the flat tube ends already experiences a deflection by the alignment of the air guidance elements toward the air outlet.

In other aspect of the invention according to claim 4 is the flow hopper from an aluminum or a steel plant material by separating and transforming processing or alternative 5 from a plastic material by plastic injection moulding manufactured according to claim in addition. A production of the flow hopper from an aluminium sheet has with the fact the advantage that these direct soldered with the tubesheet can become. In contrast to this a production of the flow hopper has the
▲ top advantage as plastic injection moulding part the fact that the length the air guidance elements non as with transformation by a sheet - on the half width of the openings limited is, but free certain and the flowtechnical requirements optimum adapted will can.

Embodiments of the invention are in the designs shown and become in the following more near described.

Here shows:

Fig. 1 a sectional view of a tube plate portion of an intercooler;

Fig. 2 a spatial representation of the tube plate portion;

Fig. 3 a spatial representation of a flow hopper in accordance with Fig. 2;

Fig. 4 a schematic view of an air outlet plenum chamber of the intercooler;

Fig. 8 a detailed view of alternative air guidance elements.

Fig. 1 shows a sectional view of a tube plate portion 10, the part of a not complete represented intercooler is. This tube plate portion 10 consists of a tubesheet 12, in whose tube plate openings are 14 flat tube ends 16 from flat tubes 18 held. Between the flat tubes 18 waving ribs are 20 arranged, which are washed by ambient air and an heat transfer between load air 19 of a turbocharger of an engine and the ambient air flowing by the flat tubes to 18 permit.

On in Fig. 1 represented upper side of the tubesheet 12 is an air outlet plenum chamber 22 arranged, which is 12 formed by a lid 24 and the tubesheet. Load air 19 flows in thus by a not represented air inlet plenum chamber 22 into the intercooler, then by the flat tubes 18 and from there out into the air outlet plenum chamber 22 and leaves over an air outlet 32, Fig. 4, the intercooler.

Parallel one to the tubesheet 12 is in accordance with the Fig. 1, 2 and 3 on that the air outlet plenum chamber 22 facing side a flow hopper 26 arranged. This flow hopper 26 possesses openings 28, whereby a flat tube end 16 an opening is 28 associated in each case. The flow hopper 26 possesses in each case in the region of the openings 28 air guidance elements 30, which extend the flat tube ends 16 after type of a diffuser. Thus load air becomes 19 delayed controlled in the region of the diffuser, which pressure losses during the mixture with that slow flowing air in the air outlet plenum chamber 22 reduced. The air guidance elements 30 are 26 formed thereby by bending upward from the flow hopper, whereby the flow hopper 26 first the air guidance elements 30 in such a manner bent subsequent by a section opened and become that the smallest width of the diffuser elements corresponds for instance to the width of the flat tube ends 16. By this bending upward the height of the air guidance elements 30 is 16 limited on the half width of the flat tube ends.

The flow hopper 26 in accordance with Fig. 1 to 3 is manufactured from an aluminium sheet. Alternative one in addition can be it as plastic injection moulding part of performed, like this in Fig. 4 schematically shown is. Thus the length of the air guidance elements 30a free can be determined and can to the flowtechnical requirements optimum adapted become, without being on the half width of the openings, like during the aluminum execution, limited. The air guidance elements 30b can do alternative also a trompetenförmige form corresponding Fig. 5 exhibit, whereby the angle beta amounts to about 20 DEG.

The air guidance elements 30a are in Fig. 4 toward the air outlet 32, which is decentralized arranged, aligned. Thus load air 19 effluent from the flat tube ends 16 already experiences a deflection toward the air outlet 32, which leads to an other Vergleichmässigung of the flow conditions within the air outlet plenum chamber 22.

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1. Heat-transfer agent, in particular intercoolers for motor vehicles, also between an air inlet plenum chamber and an air outlet plenum chamber (22) arranged flat tubes (18) and these associated waving ribs (20), whereby the flat tube ends (16) in tube plate openings (14), which in each case part the air inlet and air outlet plenum chambers is, fixed held are, characterised in that a flow hopper (26) parallel to the tubesheet (12) of the air outlet plenum chamber (22) arranged is, those the flat tube ends (16) associated openings (28) with air guidance elements (30, 30a) exhibits, toward the interior of the air outlet plenum chamber (22) extend and the flat tube ends (16) after type a diffuser extend.

2. In each case heat-transfer agents after one of the previous claims, characterised in that the air guidance elements (30, 30a) adjacent openings (28) finallaterally connected are.

3. Heat-transfer agents after one of the previous claims, characterised in that the air guidance elements (30a) an alignment toward an air outlet (32) of the air outlet plenum chamber (22) exhibit, by being longitudinal axis (34) of the air guidance elements (30a) opposite the longitudinal axis (36) of the flat tubes (18) inclined arranged.

4. Heat-transfer agent after one of the previous claims, characterised in that the flow hopper (26) from an aluminum material by separating and transforming processing manufactured is.

5. Heat-transfer agent after one of the claims 1 to 3, characterised in that the flow hopper (26) from a plastic material by plastic injection moulding manufactured is.

6. Heat-transfer agents after one of the previous claims, characterised in that the air guidance elements (30, 30a) bereichsweise curved are.

7. Heat-transfer agents after one of the previous claims, characterised in that the air guidance elements (30, 30a) in relation to the flat tube ends (16) around an angle (alpha) inclined are, which is smaller as 15 DEG.

8. Heat-transfer agents after one of the previous claims, characterised in that the air guidance elements (30b) a trompetenförmige form exhibit, whereby the aperture angle (beta) in the end region amounts to about 20 DEG.

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